

**TITLE OF THE INVENTION**

**TOUCH PAD MOUNTING DEVICE FOR AN ELECTRONIC SYSTEM**

**CLAIM OF PRIORITY**

This application makes reference to, incorporates the same herein, and claims all rights accruing thereto under 35 U.S.C. §119 through my patent application entitled *Contrivance for Mounting a Pointing Device in an Electronic System* earlier filed in the Korean Industrial Property Office on the 24th day of December 1997 and there duly assigned Serial No. 1997/73686.

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

The present invention concerns a device for mounting a cursor movement control device in an electronic system such as computer and, more specifically, to a device for mounting a touch pad device in a portable computer.

**Background Art**

Various electromechanical devices are known in the art for effecting the movement of a cursor on a display device using control signals. For example, so-called "joy-sticks" are frequently used with computing equipment to move a cursor, or another image, that is displayed on the face of the display device. A typical joy-stick operates by producing control signals by means of electrical

1 potentiometers linked to the movable actuating rod where the magnitude of the signal determines  
2 the rate of motion and the polarity of the signal determines the direction of cursor movement.  
3 Another well known device is the so-called "track ball". The track ball has a spherical member is  
4 mounted in a socket that allows the spherical member to rotate about any axis. By rotating the track  
5 ball control signals are generated that direct the motion of a cursor, or another image, along the face  
6 of a display device. Similar to the track ball is the so-called "mouse" that has a spherical member  
7 covered by a palm-sized housing. By pushing the palm-sized housing along a supporting surface  
8 the spherical member is rotated and signals are sent to the computer that control the motion of a  
9 cursor, or another image, along the face of a display device.

10 More recently developed than the above devices is the "touch pad". The touch pad allows  
11 a user to manipulate the position of a cursor, or another image, along the face of a display device by  
12 sliding a finger over the surface of the touch-pad. The touch pad can be made using a printed circuit  
13 board that has a pattern of conductors formed in a grid, using a predetermined spacing, that may is  
14 juxtaposed with a flexible plastic insulating layer having a pattern of metallization on the under  
15 surface. By depressing the flexible layer against the underlying printed circuit grid, signals are  
16 produced that are directly related to the particular point on the pad that is being touched.

17 A touch pad may be designed with several buttons that function similarly to the right and left  
18 buttons of a mouse. In the process of mounting a touch pad onto the housing of a portable computer,  
19 the touch pad plate is placed against the plastic housing and covered by a plastic mounting case. To  
20 protect the touch pad from electromagnetic interference it is necessary to plate the plastic case prior  
21 to using the plastic case to support the touch pad plate. The plating process, however, generates

1 contaminants and can adversely affect the workers in the manufacturing facility where the touch pad  
2 device is produced. In addition, the use of the plastic mounting case, in addition to the plated metal,  
3 increases the weight of the portable computer and causes the thickness of the touch pad unit to be  
4 increased, thus restricting the design flexibility of the portable computer.

5 As such, I believe that it may be possible to improve on the contemporary art by providing  
6 a touch pad mounting device that does not require a plating process, that eliminates the use of a  
7 plastic case to support the touch pad device, that reduces the thickness of the touch pad unit, that  
8 increases the safety of workers in facilities that assemble the touch pads, and that reduces the weight  
9 of electrical systems that use the touch pad mounting device.

#### 10 SUMMARY OF THE INVENTION

11 Accordingly, it is an object of the present invention to provide an improved touch pad  
12 mounting device.

13 It is another object to provide a touch pad mounting device that does not require a plating  
14 process, thus increasing the safety of workers in facilities that produce touch pad devices.

15 It is still another object to provide a touch pad mounting device that eliminates the use of a  
16 plastic case to support the touch pad device.

17 It is yet another object to provide a touch pad mounting device that reduces the thickness of  
18 the touch pad unit.

19 It is still yet another object to provide a touch pad mounting device that reduces the weight  
20 of electrical systems that use the touch pad mounting device.

1 To achieve these and other objects a device for mounting a touch pad in an electronic system  
2 may be constructed using an opening formed in the housing to expose the touch pad that is attached  
3 to the inner surface of the housing. A plurality of lugs are formed on the inside of the housing  
4 around the opening to engage the touch pad supporting case that secures the touch pad to the  
5 housing. The touch pad supporting case is made of a metallic material and is free from any plastics.  
6 This allows the touch pad unit to be thinner and lighter and avoids the need for performing a plating  
7 process on a plastic touch pad supporting case. This removes a safety hazard at manufacturing plants  
8 by avoiding exposing workers to the contaminants generated by the plating process.

9 According to another embodiment of the present invention, a device for mounting a touch  
10 pad with a selective button set, or a plurality of buttons, to input a selection signal in an electronic  
11 system such as notebook computer having a system unit mounted in a housing may be constructed  
12 using a second opening formed in the housing to expose selective button set along with the touch  
13 pad structure described above. Plugs are formed on the inside of the housing near the selective  
14 button set mounting opening, and slots are formed in one end region of the selective button set. The  
15 selective button set is directly mounted in the second opening by means of the plugs fixedly being  
16 inserted into the slots of the selective button set. Preferably, the selective button set includes a first  
17 and a second selective button, and the selective button set mounting opening, or second opening,  
18 includes a first and a second opening part for respectively receiving the first and second selective  
19 buttons. In addition, a button stopper is further provided between the first and second opening parts  
20 to limit the downward movement of the first and second selective buttons.

21 The metal plate to fixedly mount the touch pad serves to shield electromagnetic interferences.

1 It may be preferably made of a thin stainless steel plate with a thickness less than one millimeter to  
2 strengthen the device as well as reduce the weight and thickness of the housing.

### 3 BRIEF DESCRIPTION OF THE DRAWINGS

4 A more complete appreciation of this invention, and many of the attendant advantages  
5 thereof, will be readily apparent as the same becomes better understood by reference to the following  
6 detailed description when considered in conjunction with the accompanying drawings in which like  
7 reference symbols indicate the same or similar components, wherein:

8 Fig. 1 is a perspective view illustrating a notebook computer;

9 Fig. 2 is an exploded view illustrating the mounting of a touch pad in a notebook computer;

10 Fig. 3 is an exploded view illustrating a device as constructed according to the principles of  
11 the present invention for mounting a touch pad with a selective button set in a notebook computer;

12 Fig. 4 is a cross sectional view taken along line A-A' of Fig. 3;

13 Fig. 5 is a plane view illustrating the inner surface of the housing of the electronic system  
14 to which the touch pad is mounted along with the selective button set;

15 Fig. 6 is a view showing the touch pad and selective button set mounted to the inner surface  
16 of the housing of the electronic system;

17 Fig. 7 is a partial cross sectional view taken along line B-B' of Fig. 6;

18 Fig. 8 is a partial cross sectional view taken along line C-C' of Fig. 6;

19 Fig. 9A is a partial cross sectional view illustrating the position of the first and second  
20 selective buttons when they are not externally pressed; and

Fig. 9B is a partial cross sectional view illustrating the position of the first and second selective buttons when they are externally pressed.

### DETAILED DESCRIPTION OF THE DRAWINGS

Turning now to the drawings, Fig. 1 illustrates notebook computer 10 that may be constructed using system unit 12 and display panel 14. Generally, the housing of system unit 12 is provided with a keyboard and touch pad 16 with selective button set 18 working like the right and left buttons of a mouse. Before mounting touch pad 16, touch pad plate 24 is placed, as shown in Fig. 2, on plastic mounting case 26, which is fixedly mounted to housing 13 by means of screws 28 that are inserted into bosses 22 that are formed on housing 13. Plastic mounting case 26 must be plated to shield electromagnetic interferences.

Figs. 3 through 5 illustrate a device for mounting touch pads as constructed according to the principles of the present invention. Housing 30 of the system unit, or base, of a notebook computer is provided with a touch pad mounting opening, also referred to in the claims as an opening or a first opening, 32, around which fixing projections such as lugs and bosses are formed to hold metal plate, also referred to as a touch pad supporting case in the claims, 60. Metal plate 60 secures touch pad 50 onto the inside of the housing towards the touch pad mounting opening 32. In addition, selective button set, also referred to in the claims as a plurality of buttons, 92 is mounted in a selective button set mounting opening, also referred to in the claims as a second opening, 90 formed adjacent to the touch pad mounting opening in the housing, so that the buttons located on the selective button set may be pressed from outside of the housing. Formed across selective button set mounting opening

90 is button stopper 91 that limits the downward movement of buttons of selective button set 92, as shown in Figs. 3 and 4. Selective button set 92 may be constructed using first selective button 94, second selective button 96, resilient strips 98, 98', 100, 100', and connecting strip 102. First and second selective buttons 94 and 96 are symmetrically positioned in selective button set mounting opening 90 with button stopper 91 facing the lower surfaces of the adjacent parts of the two selective buttons 94 and 96, as shown in Fig. 5. The two resilient strips 98 and 98' are connected between first selective button 94 and connecting strip 102, and the other two resilient strips 100 and 100' are connected between second selective button 96 and connecting strip 102. The resilient strips serve to recover the selective buttons after they have been depressed by a user. Connecting strip 102 connects the selective button set with the housing. In the present embodiment, a plurality of protuberances, also referred to as a plurality of plugs in the claims, 106a, 106b, 106c, 106d are integrally formed on the inside of the housing and can be inserted into corresponding slots 104a, 104b, 104c, 104d that formed in connecting strip 102. The protuberances and slots may be firmly fastened by means of heating.

Referring to Fig. 5, to attach metal plate 60 to the inside of the housing, there are provided bosses 34 and lugs 36, 38, 40 on the inside of the housing around touch pad mounting opening 32. Lugs 36, 38, 40 are formed on the peripheral regions of the touch pad mounting opening 32 except the peripheral region where bosses 34 are formed. Lugs 36, 38, 40 respectively have hooks 37, 39, 41 formed facing the direction opposite to that of bosses 34. It is desirable to have at least three lugs. Metal plate 60 supports the touch pad 50 towards the touch pad mounting opening 32, fastened to the bosses 34 and lugs 36, 38, 40. To this end, the metal plate 60 includes concave receiving part 62,

fixing part 64, resilient part 66, first connecting part 68 and second connecting part 70. Receiving part 62 has cable aperture 72 for holding touch pad 50. Through cable aperture 72 is inserted a cable for connecting touch pad 50 with the electronic system. Fixing part 64 is extended from one side of receiving part 62 by a given interval, having slots 65 connected with bosses 34 by means of fasteners 86. Resilient part 66 is extended from the side of receiving part 62 opposite to fixing part 64 by a given interval, having slots 76 fastened to lugs 36 on the housing. Resilient part 66 is inclined by a given angle with respect to receiving part 62, as shown in Fig. 3, to impart a resiliency to the receiving part. First connecting part 68 has slots 74 fastened to lugs 38. Second connecting part 70 is extended from the side of receiving part 62 opposite to first connecting part 68, having slots or cuts 78 fastened to lugs 40. In addition, fixing and resilient parts 64 and 66 are provided with protuberances 82, 84 to assist the mounting of touch pad 50 to housing 30. Protuberances 82, 84 are formed adjacent to the sides of resilient part 62 towards touch pad 50. Also formed the inside of housing 30 adjacent to bosses 34 are further protuberances 42 to fasten to slots 80 formed in fixing part 64. Slots 80 and protuberances 42 are to facilitate the connection of fixing part 64 to the bosses.

The mounting of the touch pad on the inside of the housing, as shown in Figs. 6 through 8, starts with resilient part 66 of metal plate 60 being fastened to lugs 36 with slots 76 held by the hook of lug 36. At the same time, first and second connecting parts 68 and 70 are respectively connected to lugs 38 and 40. Then, pulling metal plate 60 towards bosses 34, fixing part 64 is securely placed on bosses 34 by means of slots 80 receiving protuberances 42. Finally fasteners 86 are turned through slots 65 of fixing part 64 into bosses 34.



1 Meanwhile, first and second selective buttons 94 and 96 of the selective button set 92 are  
2 inserted in selective button set mounting opening 90 while connecting strip 102 is connected to the  
3 inside of the housing by means of the slots 104a, 104b, 104c, 104d respectively holding plugs 106a,  
4 106b, 106c, 106d. The slots and plugs may be firmly fastened with each other by the heat treatment  
5 usually called heat stake. Provided on the lower side of the selective button set 92 is a circuit board  
6 with switches that act cooperatively with the touch pad.

7 Referring to Figs. 9A and 9B, first and second selective buttons 94 and 96 serve as the left  
8 and right buttons of the mouse, and may be pressed separately or simultaneously. Pressing the first  
9 and second selective buttons after locating the pointer by touching the touch pad, the selective  
10 buttons 94 and 96 descends downwards. The descending movement of the buttons is limited by the  
11 button stopper 91. The position of the button stopper 91 may be determined according to the  
12 switches operated by the buttons 94 and 96.

13 Although this preferred embodiment of the present invention has been disclosed for  
14 illustrative purposes, those skilled in the art will appreciate that various modifications, additions and  
15 substitutions are possible, without departing from the scope and spirit of the invention as disclosed  
16 in the accompanying claims. It is also possible that other benefits or uses of the currently disclosed  
17 invention will become apparent over time.